Science's Newest Discoveries About Saturn—Earth's Most Mysterious Brother

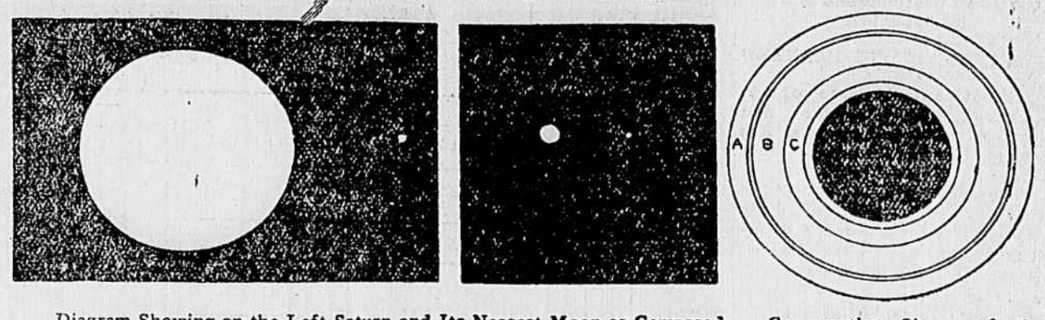

Diagram Showing on the Left Saturn and Its Nearest Moon as Compared on the Right to Earth and Our Satellite.

Comparative Sizes and the Distances Apart from Each Other and from Saturn of Its Three Rings, A, B and C. (A) the Thin Outermost Ring; (B) the Solid, Shining Middle Ring; (C) the Crepe Ring.

The Planet That Is So Light That It Would Float on the Surface of Our Seas; the Weird Rings That Threaten Ever to Fall Upon It; the Encircling Moons That Float Ever in an Eternity of Frozen Death

Reconstruction of How Saturn and Its Rings Would Look from Japetus, One of Its Nearest Moons.

A Photograph of Saturn Spinning in Space.

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Connected with the Nautical Almanac Office of the U. S. Naval Observatory at Washington.

THE planet Saturn, dull and uninteresting to the unaided eye, and considered by the ancients to be of evil influence, becomes in the telescope the most remarkable, mysterious and interesting member of the solar system.

Saturn is unique for two reasons. It is, in the first place, the lightest of all the planets, for its density is only six-tenths that of water. This means it would float if we could imagine it in an ocean great enough to contain its huge bulk, which is nearly 77,000 miles in diameter. All the other planets are heavier than water.

The most noticeable feature about this planet, however, is its wonderful ring system. It is encircled by three symmetrical, concentric rings. The inner edge of the ring nearest to the planet, known as the dusky or crepe ring, is separated from the planet's surface by a scant 6,000 miles. It extends outward uniformly in all directions for 11,000 miles and gradually merges into the second ring, known as the bright ring.

This ring extends 18,000 miles beyond the dusky ring and its brightness increases towards its outer border. It is decidedly the brightest and largest of the three rings.

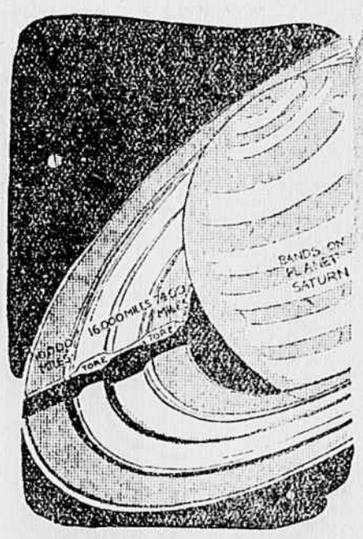
It is separated from the third and last ring, which is of the same width as the crepe ring, by a narrow gap of 2,200 miles uniformly wide in all parts. This peculiar opening between the rings is known as "Cassini's Division," since it was first discovered by the astronomer Cassini. The entire ring system extends to a distance of more than 86,000 miles from the centre of the planet and measures 172,000 miles across.

The rings are marvelously thin, however, measuring only about fifty miles in depth. If we should make a model of the system two feet across, a sheet of writing paper would be too thick to represent the proportional thickness of the system.

No living creature may gaze upon the beauty of the heavens from the planet Saturn for it is a world of chaos, composed almost entirely of gaseous matter, and is the lightest member of our solar system in proportion to its size.

No man could gain a foothold upon this planet for he would be engulfed at the surface in the whirling, seething vapors of a world in the making. The equatorial regions of Saturn, it has been discovered, rotate more rapidly than the higher latitudes. No stable conditions could exist upon the surface of such a planet. If a solid crust should start to form portions in different latitudes would be forced to move at different rates and the mass would be torn asunder.

This unequal time of rotation for different latitudes is characteristic also of the sun and Jupiter. The sun, we know, is almost entirely gaseous, and Saturn, with a density less than either the sun or Jupiter, cannot be otherwise. There is this very marked difference between the gaseous sun and the gaseous planets Jupiter and Saturn, however:



Cross Section of Saturn's Rings Showing Their Arrangement.

While the sun, on account of its enormous size, seems to possess a limitless store of light and heat, unabated through millions of years, the gaseous planets Jupiter and Saturn, which were originally mere fragments torn from the primitive solar mass, are cooling rapidly and condensing gradually as they cool toward the solid conditions presented by the inner planets, Mercury, Venus, Earth and Mars, which, on account of their insignificant size, have cooled most rapidly.

Of course, we cannot say positively that the gaseous planets Jupiter and Saturn, and probably Uranus and Neptune as well, will ever attain a solid surface condition, or that they will ever support life at some future time. Such factors as a possible difference in the materials entering into their composition, and the effect of different kinds of atmospheres, as well as differences in temperatures, due to enormous differences in relative distances from the sun, all have to be taken into account.

It puzzles astronomers considerably to explain why Saturn is, proportionately to its size, considerably lighter than Jupiter. According to the La Place theory the planet Saturn would be further along in evolution than Jupiter, for it was abandoned by the solar nebula long before Jupiter left the parent mass.

The Chamberlin and Moulton theory and the theory of Professor See concerning the origin of the solar system do not have this difficulty to meet, for they both assume that the various nuclei existing in the primitive nebula of spiral forms were undergoing condensation simultaneously, and therefore impose no condition upon the order of development of the planets.

Possibly some nuclei possessed a preponderance of the heavier gases. The shattered portions of a disrupted sun may not have been homogeneous in their nature. We know that the lighter gases, hydrogen, helium, etc., are at the solar surface and found in its enveloping atmosphere and nearer the centre we would expect to find the denser, heavier gases. Maybe in the dim past Saturn, for some reason, started with a nucleus less dense than its huge neighbor, Jupiter.

Even in the short time man has been privileged to observe the gaseous planets transitory changes have been noted, probably changes due to gaseous eruptions. Observations of Saturn, at Flagstaff, Ariz., in the Winter of 1916, showed a remarkable change in the color of the planet's ball.

What eruptions of gases in this turbid world caused this peculiar change of hue? Was there a precipitation of liquid particles suspended in the gases that compose the planet's atmosphere? The exact cause of the change in appearance of the planet was, of course, not definitely known, but it was doubtless due to some gaseous outburst.

The inhabitants of the planet Earth, with only one attendant moon to adorn the heavens, can hardly realize the endless variety and beauty of celestial scenery visible from the planet Saturn. At least nine satellites, possibly more, encircle this planet continuously and show all the different phases that our moon presents to us. At one and the same time may be seen crescent moons and gibbous moons, new moons and full moons, some dart rapidly across the heavens, passing quickly from one phase to the next, while others move slowly and majestically as does our own moon. The nearest satellite makes its circuit of the planet in less than one day! The outermost requires one year and six months.

There is a great difference in the sizes of the satellites also. Phoebe, the farthest from Saturn, is hardly 200 miles in diameter. Mimas, the nearest, has a diameter of 600 miles, while Titan, the largest of all, is the size of the smallest of the planets, Mercury, and measures 3,000 miles through. Another, Japetus, is almost exactly equal to our own moon in size (2,100 miles in diameter).

Saturn receives at its surface only one-ninetieth as much light and heat from the sun as the Earth receives, and unless its surface is supplied with heat from a hot interior, it is a very cold place, indeed, though Saturn is intensely hot within. Just how much, if any, light and heat is radiated from the planet to its satellites astronomers have no means of determining at present. It is generally supposed that the planets Jupiter and Saturn do not furnish their satellites with any appreciable amount of light and heat. They are believed to have cooled beyond this stage.

If this is so, life would be impossible upon the satellites of Saturn, at least life as we know it, for the intense cold prevailing at such a great distance from the sun and also the scarcity of atmosphere always found in connection with small bodies would prohibit it. The small members of the solar system, such as Mercury, Mars, the Moon and satellites of Jupiter and Saturn, do not possess a force of gravity strong enough to permanently hold under control the atmospheric gases so necessary to life. The satellites of Saturn are probably like our moon, cold and lifeless now, though there may have been a transitory stage, when Saturn furnished them with light and heat, and when all their atmospheres had not departed, in which life flourished for some ages.

Far eclipsing the satellites as a scenic feature, a magnificent arch is seen to span the Saturnian heavens, shining by reflected sunlight, and composed of myriads of dust-like particles. Each particle is a tiny moonlet, making its journey around Saturn in an independent path. Collectively they form the famous rings of Saturn.

The rings assume constantly varying angles of inclination with reference to the Earth, because they lie practically in the plane of Saturn's equator, which is tilted to the Earth's path at an angle of 28 degrees. As Saturn swings around the Sun, completing a circuit once in twenty-nine and a half years, its axis always keeps parallel to itself, as does the Earth's axis.

As a result we view the rings at all inclinations varying from zero to 28 degrees. Twice during Saturn's revolution around the Sun, or once in fifteen years, the plane of the rings assumes an edgewise position with reference to the Earth, and the rings entirely disappear from view for a few hours, even in the most powerful telescopes.